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The triangle $M_a M_b M_c$ is similar to the triangle ABC .

$$\sphericalangle OM_a M_c = \sphericalangle QAC.$$

$$\sphericalangle OM_b M_c = \sphericalangle QBC.$$

$$\sphericalangle OM_c M_a = \sphericalangle QCA.$$

$\therefore O$ with respect to the triangle $M_a M_b M_c$, is located precisely as Q is with respect to the triangle ABC .

Hence O is Nagel's point of triangle $M_a M_b M_c$.

Also solved by *F. M. McGAW* and *G. B. M. ZERR*.

74. Proposed by **ROBERT J. ALEY, A. M., Ph. D., Professor of Mathematics, Indiana University, Bloomington, Indiana.**

Let O be the center of the inscribed circle. AO produced meets the circumcircle in A' . Find the ratio of AO to OA' .

I. Solution by **WILLIAM HOOVER, A. M., Ph. D., Professor of Mathematics, Ohio University, Athens, Ohio.**

The coördinates of A are $\left(\frac{2\Delta}{a}, 0, 0\right)$; of O , (r, r, r) ; and of A' , those of the intersection of $\beta - \gamma = 0 \dots (1)$, with $a\beta\gamma + b\alpha\gamma + c\alpha\beta = 0 \dots (2)$, having the constant relation $a\alpha + b\beta + c\gamma = 2\Delta \dots (3)$. These give for the coördinates

$$\text{of } A' \left(-\frac{(b+c)^2}{a^2} - \frac{2\Delta}{a}, \quad \frac{(b+c)^3}{a^3} + \frac{2\Delta(b+c)}{a^2}, \quad \frac{(b+c)^3}{a^3} + \frac{2\Delta(b+c)}{a^2} \right).$$

The distance d between $(\alpha_1, \beta_1, \gamma_1)$ and $(\alpha_2, \beta_2, \gamma_2)$ is given by

$$d^2 = -\frac{abc}{4\Delta^2} \{a(\beta_1 - \beta_2)(\gamma_1 - \gamma_2) + b(\gamma_1 - \gamma_2)(\alpha_1 - \alpha_2) + c(\alpha_1 - \alpha_2)(\beta_1 - \beta_2)\} \dots (4).$$

Putting $\alpha_1 = (2\Delta/a)$, $\beta_1 = c$, $\gamma_1 = 0$; $\alpha_2 = \beta_2 = \gamma_2 = r$,

$$\overline{AO}^2 = bcr(b+c-a)/2\Delta \dots (5).$$

Putting $\alpha_1, \beta_1, \gamma_1$ equal respectively to the coördinates of A' , and $\alpha_2 = \beta_2 = \gamma_2 = r$ as before, in (4), we get an expression for $\overline{OA'}^2$.

We can then express the ratio of OA to OA' .

II. Solution by **J. SCHEFFER, A. M., Hagerstown, Maryland.**

The point A' is evidently the middle point of arc BC . Since $\angle A'OC = \frac{1}{2}(A+C)$ and $\angle A'CO = \frac{1}{2}(A+B)$, $OA' = A'C = A'B$.

From Ptolemy's theorem, $ACA'B$ being a cyclic quadrilateral,

$$AB \times A'C + AC \times A'B = AA' \times BC, \text{ or}$$

$$c \times OA' + b \times OA' = (AO + OA')a.$$

$$\therefore OA : OA' = b+c-a : a = 3-a : 2a.$$

Also solved by *G. B. M. ZERR* and *CHAS. C. CROSS*.